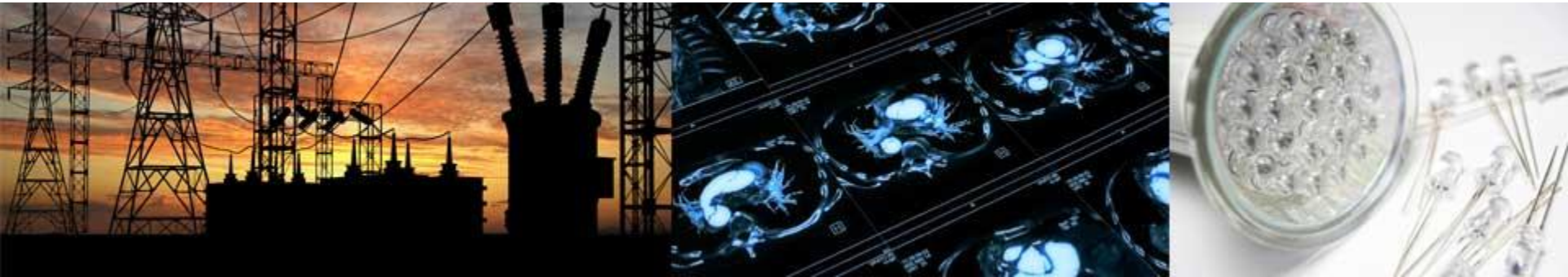


EPA SF6 Emission Reduction Workshop

San Francisco, CA
January 24-25, 2017



The Association of Electrical and Medical Imaging Equipment Manufacturers





About Us

Electric Transmission & Distributions SF₆ Coalition

- Industry discussion of SF₆ related issues
- Industry voice for SF₆ policy and regulatory action
- OEMS, SF₆ producers and distributors, regulatory agencies and industry-related service companies
- Administered by NEMA
- <http://www.nema.org/Products/Pages/The-Electric-Transmission-and-Distribution-SF6-Coalition.aspx>

National Electrical Manufacturers Association

- Trade association and standards development organization
- Rosslyn, VA
- 350+ membership



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Medical Imaging Equipment Manufacturers



SF₆ Reporting Challenges



SF₆ Emissions Reporting



US Greenhouse Gas Reporting Rule - Subpart DD

- Who? Owners and operators of electric T&D equipment >17,820 lbs
- What? Annual SF₆ emissions
- Where? US EPA, MA Dept of Env Protection and CA Air Resources Board
- How? Emissions = (Decrease in SF₆ Inventory) + (Acquisitions of SF₆) - (Disbursements of SF₆) - (Net Increase in the **Nameplate Capacity** of Equipment)
 - Inventory: The SF₆ stored in containers at the beginning of the year minus the SF₆ stored in containers at the end of the year.
 - Acquisitions: The sum of the amount of SF₆ that is: 1) purchased from distributors; 2) purchased from equipment manufacturers; and 3) returned to the facility after offsite recycling.
 - Disbursements: The sum of the amount of SF₆ that is: 1) in bulk and contained in equipment that is sold to other entities; 2) returned to suppliers; and 3) sent off site for recycling or destruction.
 - Nameplate Capacity: The nameplate capacity of new equipment minus the nameplate capacity of retiring equipment
- Emission Rate = lbs of SF₆ emitted/total **nameplate capacity** under management



Nameplate Background



Several points of information

- Make, model, insulation medium, voltage, etc.



Total Weight of Insulating Medium:

- Not a maximum threshold
- Meant to indicate approximate mass of SF₆ that GIE will hold once it is filled to the proper density



Nameplate Background



Where does SF₆ lbs figure come from?

- Nameplate figure = No safety indication
- Facilitates recordkeeping for purposes of inventory acquisition
- Temperature-pressure curve
 - PSIG @ Temp = Density
 - Volume (ft³) / Density = lbs.
- OEM calculations
- Industry standard - IEEE
 - OEMS
 - Utilities
 - No accuracy requirement



Reporting Challenges



Changes in Equipment Design

- Tank and bushing wall thickness = change in volume but not in required density for insulation
- Density = mass/volume
 - GIE Series A, Model 1: $0.38 \text{ lbs./ft}^3 = 526.3 \text{ lbs}/200 \text{ ft}^3$ (Nameplate says 526.3 lbs)
 - GIE Series A, Model 2: $0.38 \text{ lbs./ft}^3 = 513 \text{ lbs}/195 \text{ ft}^3$ (Nameplate says 526.3 lbs)
- If this GIE is involved in a **reportable event**, user would be forced to report a “phantom emission”
- Why didn't OEMs change the nameplate?
- Resolution
 - Equipment in the field: OEM-User collaboration to change the nameplate
 - New equipment
 - IEEE Standards for nameplate accuracy
 - OEM internal initiatives (sealed equipment)



Reporting Challenges



Field Errors:

- Commissioning and Maintenance
 - Temperature-Pressure curve
 - Gas temperature, not ambient
 - Pressure gauge
 - Intentional overfill
- Decommissioning
 - Removal of SF₆ from tank to cylinder
 - Gas can remain trapped in the hose and/or recovery system (not emitted into the atmosphere)
 - Technician weighs cylinder and records missing SF₆ as an emission
 - Gas in the hose/recovery system ends up in another cylinder or GIE
- If this GIE is involved in a **reportable event**, user would be forced to report a “phantom emission” if amount of SF₆ is less than the nameplate.



Reportable Events

- 💡 Installed during the reporting year (NC of equipment operated)
- 💡 Retired during the reporting year (NC of equipment operated)
- 💡 Gas syphoned between GIE and storage cylinder (Inventory)
 - Emissions = (Decrease in SF₆ Inventory) + (Acquisitions of SF₆) - (Disbursements of SF₆) - (Net Increase in the Nameplate Capacity of Equipment)
- 💡 Gas syphoned from GIE into storage cylinder and sent off-site (Disbursement)
 - Emissions = (Decrease in SF₆ Inventory) + (Acquisitions of SF₆) - (Disbursements of SF₆) - (Net Increase in the Nameplate Capacity of Equipment)



Reportable Events

Gas syphoned between GIE and storage cylinder

Status January 1	Status December 31
GIE: Nameplate 100 lbs (charge 100 lbs)	GIE: Nameplate 100 lbs (charge 105 lbs)
Cylinder A: Empty	Cylinder A: 100 lbs
Cylinder B: 105 lbs	Cylinder B: Empty
Emission Calculation Formula: $(5) + (0) - (0) - (0) = 5$ lbs	



Prevalence of Error*

- 💡 Total HV circuit breakers inspected: **221**
- 💡 HV circuit breakers that had a nameplate discrepancy greater than 1%: **184**
- 💡 HV circuit breakers with inaccurate nameplates greater than 1%: **31**
- 💡 Tested within 1% accuracy: **6**
- 💡 Note: 1% error in nameplate capacity or discrepancy does NOT equal 1% error in emission rate

*Data provided by DILO



So What?

- 💡 No target for US EPA
- 💡 CA is currently at 4%; large enough margin to avoid fines
- 💡 BUT...
 - CA cutting targets to 1% by 2020, with fines
 - Who will follow?



Get Ahead of the Issue

 Reporting entities need the ability to correct reporting inaccuracies

- Accurately gage GIE charge
- Identify whether nameplate is accurate

 Methodology

- Pressure/Mass Calculation
- Complete SF₆ Recovery



Regulatory Solution



SF₆ Coalition working with regulatory agencies to allow...

- Use of figure other than nameplate; and/or
 - Would require collaboration with OEMs to certify the alternative figure
- **Statistical evidence of phantom emissions**



Regulatory agencies want/need to hear from the regulated community



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Questions?

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